



Mid-Carolina Probe, LLC.

Environmental Services & Geoprobe Drilling & Injection Services



Adam Looper, Hydrogeologist
Corrective Action Section
UST Management Division
Bureau of Land & Waste Management
2600 Bull Street
Columbia, South Carolina 29201

November 15, 2016

Re: Corrective Action Plan

Copelands Service Station
700 Musgrove Street
Clinton, South Carolina, 29325
Release Reported June 24, 1990
UST Permit 05694 CA # 53511



Dear Mr. Looper,

Please find enclosed a copy of the Corrective Action Plan (CAP) prepared by Mid-Carolina Probe, LLC for the referenced site. On October 11, 2016, CA# 53511 was awarded to Mid-Carolina Probe, LLC for Copelands Service Station, located at 700 Musgrove Street in Clinton, SC. The CAP for Copelands Service Station will be performed concurrently with the CAP for the Short Stop UST Permit #05678.

Along with the CAP submittal, Mid-Carolina Probe, LLC is requesting a variance in order to remove free product by aggressive fluid vapor recovery (AFVR) and possibly submersible pumps and bailers from any of the monitoring wells that currently contain free product within the monitoring well network. Details of the free product removal activities will be documented in corrective action system evaluation reports for the site.

Based on our review of the current site conditions, historic assessment results and groundwater monitoring, Mid-Carolina Probe, LLC recommends implementation of the attached CAP. If there are any questions regarding the contents of the CAP, please feel free to contact me.

Best Regards,

F. Dean Salisbury, PG
Mid-Carolina Probe, LLC

258 Tapp Road
Greer, SC 29651-5221

Phone: 864-752-5025
midcarolinaprobe@yahoo.com



Mid-Carolina Probe, LLC.

Environmental Services & Geoprobe Drilling & Injection Services

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JR Rentals, Inc., PO Box 117, Clinton, SC 29325
Sharon H. Venable, PO Box 504, Clinton, SC 29325
Ruby Butler, 709 Shands St., Clinton, SC 29325

CORRECTIVE ACTION PLAN

**Copelands Service Station
700 Musgrove Street
Clinton, South Carolina 29325**

SCDHEC UST NO. 05694

November 15, 2016

Prepared for:

SC Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Prepared By

Mid-Carolina Probe, LLC
258 Tapp Road
Greer, South Carolina, 29651-5221

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Appendix A	Site Tax Map
Appendix B	Current Monitoring Results and SSTL's
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CERTIFICATION

PROFESSIONAL GEOLOGIST LICENSED IN THE STATE OF South Carolina

I certify that I am a Licensed South Carolina Professional Geologist. As indicated by my signature below, the evaluation of the data and the preparation of this corrective action plan were performed by a South Carolina Professional Geologist.

Name: F. Dean Salisbury, P.G.

Signature: *F. Dean Salisbury*

Date: November 15, 2016



South Carolina Stamp or Seal

1.0 INTRODUCTION

This document serves as the Corrective Action Plan (CAP) for the the former Copeland's Service Station located at 700 Street, in Clinton, South Carolina. The CAP has been developed by Mid-Carolina Probe, LLC and is pursuant to a South Carolina Department of Health and Environmental Control (SCDHEC) contract award, effective on October 11, 2016.

Site Location and Usage - The site is located at 700 Musgove Steet, within Laurens County, South Carolina as shown on **Figure 1**. A map showing the site features and monitoring well locations is provided on **Figure 2**. A copy of the tax map showing the site boundaries and properties in the vicinity is included in **Appendix A**.

According to previous reports, the site has been used in the past as a service station that is currently not in operation. Previous assessment activities on the site included Tier 1 and Tier II assessments of the site. Interim remedial action including aggressive fluid vapor recovery (AFVR) events were also implemented at the site. According to previous reports, a release was reported at the site in June 1993.

2.0 ASSESSMENT AND MONITORING RESULTS

Regional and Site Geology – The site is located within the Piedmont Physiographic Province of South Carolina. The saprolite at the site is formed from the insitu weathering of the parent granitic rocks that underlie the saprolite. The soil profile of the saprolite can be described as clayey soils with underlying sandy silts, and silty sands. The transitional zone between the bedrock and saprolite is generally uneven regionally with possible rock lenses where preferential weathering of the parent rock has occurred.

Groundwater Plume – Review of the information provided in the appendix of the SCDHEC corrective action solicitation, indicates groundwater samples were collected from monitoring wells on March 24, 2016. Based on samples collected on March 24, 2016, the highest BTEX concentrations were detected at MW-14, located on the southern edge of the property, at a total BTEX concentration of 90,400 micrograms per liter (ug/l). The next two highest total BTEX concentrations were reported from AFVR-6 and MW-17 at 86,000 ug/l and 78,600 ug/l, respectively. The three monitoring wells, MW-14, AFVR-6, and MW-17, are located, within the center of the site, near the former UST area. Light non-aqueous phase liquid (LNAPL) was detected during the March 24, 2016 sampling event at a thickness of 0.8 feet at MW-13.

As per the corrective action solicitation, site specific target levels (SSTLs) have been established for the petroleum impacted monitoring wells at the site. Tables with the most recent groundwater sampling results, from the March 24, 2016 gauging event, and the associated SSTLs

for each of the SSTL wells are included in **Appendix B**. Cross sections are included in **Appendix C** of which contains the UIC permit application.

3.0 REMEDIAL APPROACH

The LNAPL plume will be remediated using a combination of AFVR and injections of activated carbon and magnesium sulfate. Sodium sulfate may be substituted for magnesium sulfate depending on availability and current pricing. A surfactant may also be used in select areas where LNAPL occurs at the site.

Other product recovery techniques such as skimmer pumps may also be utilized. The injections will be performed as described in the UIC permit application included in **Appendix C**. The injections will be used to enhance the microbial degradation of the hydrocarbon plume. Initially, the injectant material will be injected through Geoprobe rods within select areas of petroleum hydrocarbon plume to determine optimal injection rates and radius of influence. Details of the proposed injection activities are provided in the UIC permit application in **Appendix C**.

Initially, an AFVR event will be conducted at the site and the results of the event will be reported in the startup corrective action report for the site. Based on the results of the AFVR event, additional AFVR events may be conducted at the site. Based on the recoverability of LNAPL at the site, Mid-Carolina Probe, LLC may elect to install up to 5 recovery wells for the removal of LNAPL utilizing additional vacuum extraction techniques and/or skimmer pumps. Details of the proposed recovery well installation are provided in the UIC permit application in **Appendix C**.

4.0 SCHEDULE OF IMPLEMENTATION

Task	Schedule
Initial Monitoring Report	45 days from the approval of the Site Specific Work Plan (SSWP)
CAP Implementation	30 days from SCDHEC's Notice to Proceed. Initial startup will consist of an AFVR event or at least one injection event.
Corrective Action System Evaluation Report	Quarterly from the date of CAP Implementation or on another schedule approved by SCDHEC
Monitoring Wells Groundwater Sampling and Surface Water Samples.	Semi-annually from the date of CAP implementation or on another schedule approved by SCDHEC
Update Site Specific Work Plan (SSWP) for Corrective Action	Annually until the corrective action is completed
Closure of site, removal of remediation equipment and abandonment of monitoring and recovery wells.	Within 60 days of the SCDHEC notice to proceed with closure activities

5.0 SUMMARY OF REMEDIAL ACTIVITIES

Upon approval of this CAP, Mid-Carolina Probe, LLC will initiate the following corrective action activities for this site:

- Complete the initial corrective action startup which will include an initial injection or an AFVR event within the area of LNAPL accumulation. The initial injection activity will include injection of at least one injection point.
- Implementation of biostimulation injections as described in the injection permit utilizing activated carbon and sulfate injections.
- Groundwater monitoring activities will be performed as per the SSWP for the site.

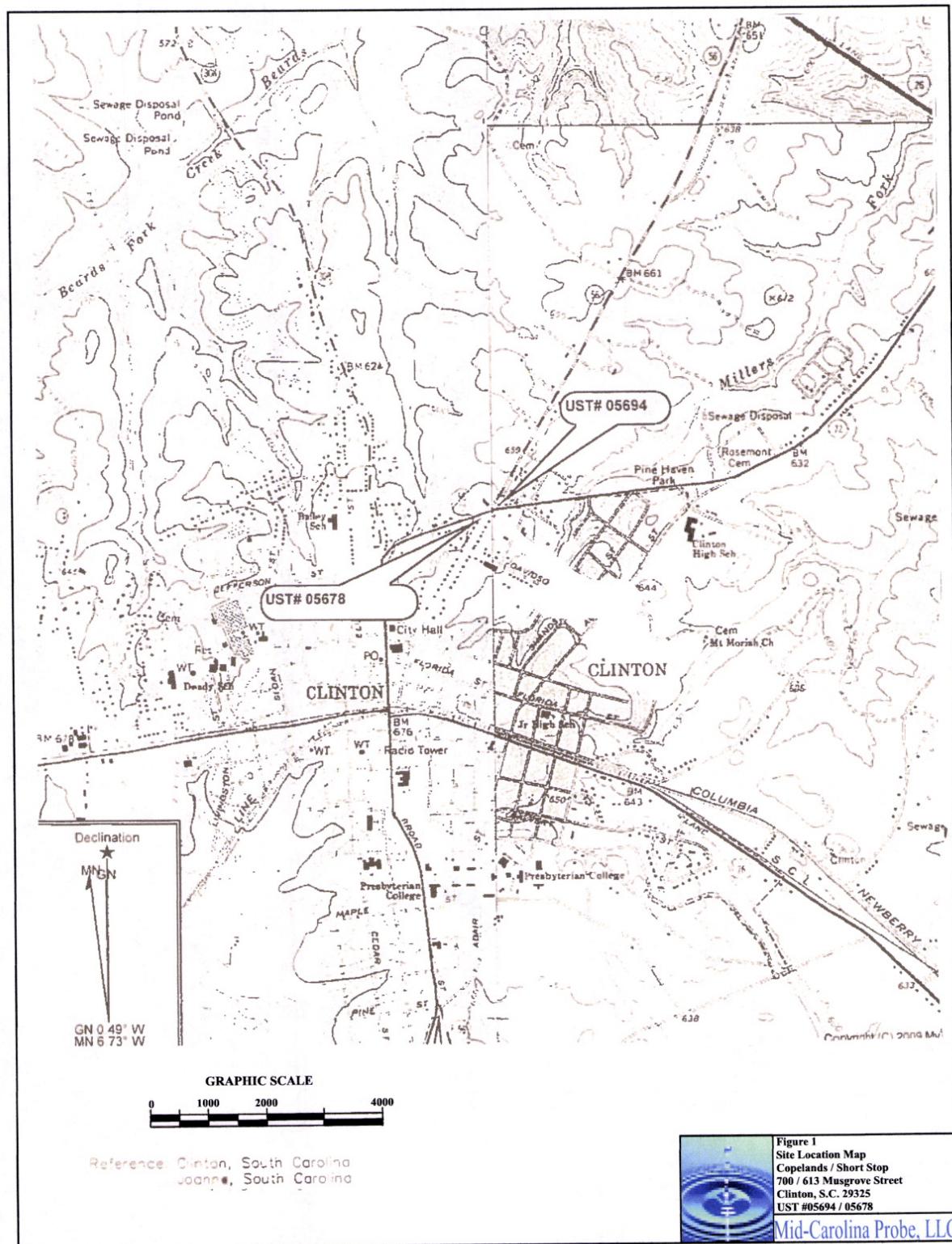
Based on the information Mid-Carolina Probe, LLC has reviewed to date, the estimated time frame to obtain remediation goals is estimated to be 60 months or less with two consecutive quarters of confirmation monitoring. Mid-Carolina Probe, LLC will strive to achieve the remediation goals in a safe and efficient manner using the best technically feasible approach.

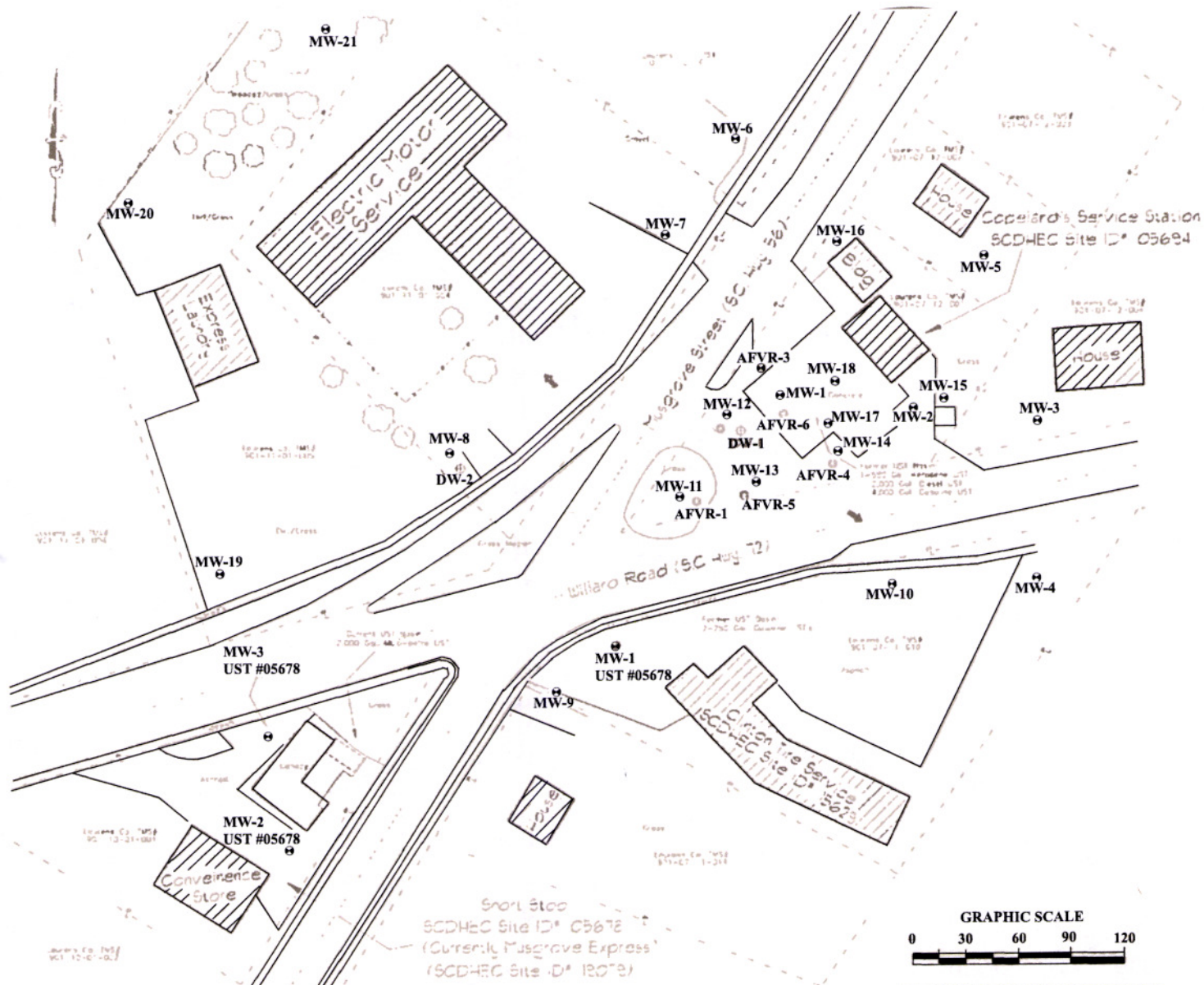
6.0 REFERENCES

Midlands Environmental Consultants, Inc., Report of Groundwater Sampling and Chemical Analyses, Copeland's Service Station, 700 Musgrove Street, Clinton, South Carolina, SCDHEC Site ID No. 05694, CA # 51948, MECI Project Number 16-5459, April 4, 2016.

South Carolina Department of Health and Environmental Control (SCDHEC) Solicitation No. 54000011996 documents including the technical information contained within the Appendix pages, issued by SCHEC on August 29, 2016.

Figures





- LEGEND**
- ⊙ Location of Water Table Bracketing Monitoring Well
 - ⊙ Location of Double Cased Monitoring Well
 - ⊙ Location of AFVR Extraction Well
 - ➔ Estimated Groundwater Flow Direction
 - Estimated Location of Existing Underground Storage Tanks
 - ▭ Property Line

Drawing Based on PELI - Plot Notes, Tax Maps, and a RLS Survey. The title block is dated 4/1/12.

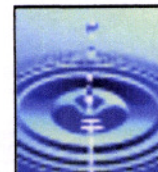


Figure 2
 Copelands Service Station
 700 Musgrove Street
 Clinton, S.C. 29325
 UST #05694

Mid-Carolina Probe, LLC

Appendix A

Site Tax Map

Laurens County GIS



*** THIS MAP IS NOT TO BE USED AS A PLAT ***

Appendix B

SSTL Table and Current Laboratory Results

Table of Current CoC Concentrations and FPP Thicknesses in Groundwater

CoC concentrations in parts per billion (µg/l) and free-phase product thicknesses in feet based on the March 24, 2016 sampling and gauging:

Well	FPP Thickness (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	Naphthalene	1,2 DCA	EDB	TAA	TAME	ETBA	TBA	TBF	DIPE	ETHANOL	ETBE
MW-1	0	3000	31000	3600	29000	<1000	940J	<1000	26	<20000	<2000	<20000	<20000	<20000	120J	<200000	<20000
MW-3	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-4	0	<5	<5	<5	<5	4J	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-5	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-6	0	<5	<5	<5	0.78J	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-7	0	<5	<5	<5	1.8J	<5	0.39J	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-8	0	<5	<5	<5	<5	<5	<5	<5	<0.02	<100	<10	<100	<100	<100	<10	<1000	<100
MW-9	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-10	0	<5	<5	<5	<5	5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-11	0	<5	0.87J	39	260	<5	30	<5	<0.019	<100	<10	<100	6.5J	<100	<10	<1000	<100
MW-12	0	380J	8500	1700	20000	<500	650	<500	0.48	<10000	<1000	<10000	<10000	<10000	<1000	<100000	<10000
MW-13	0.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
MW-14	0	20000	56000	4400	28000	<2500	650J	1400J	190	62000	<5000	<50000	3300J	<50000	1500J	<500000	<50000
MW-15	0	<5	<5	<5	<5	<5	<5	<5	0.018J	<100	<10	<100	<100	<100	<10	<1000	<100
MW-16	0	<50	50	520	3300	<50	430	<50	<0.019	<1000	<100	<1000	160J	<1000	<100	<10000	<1000
MW-17	0	16000	37000	3600	22000	420J	550J	1200	55	46000	<2000	<20000	6600J	<20000	2000	<200000	<20000
MW-18	0	4600	36000	4900	27000	56J	630J	<1000	16	390J	<2000	<20000	<20000	<20000	<2000	<200000	<20000
MW-19	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-20	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-21	0	2.2J	<5	<5	8.5	<5	0.92J	<5	0.029	10J	<10	<100	4.7J	<100	<10	<1000	<100
DW-1	0	3900	<250	<250	<250	<250	92J	<250	<0.019	7800	<500	<5000	640J	<5000	260J	<50000	<5000
DW-2	0	1100	<50	3.5J	1200	<50	150	120	0.078	3700	<100	<1000	260J	<1000	150	<10000	<1000
AFVR-1	0	<5	1.5J	80	380	<5	29	<5	<0.019	<100	<10	<100	7.9J	<100	<10	<1000	<100
AFVR-2	0	780	11000	2100	18000	<250	790	<250	1.5	160J	<500	<5000	<5000	<5000	38J	<50000	<5000
AFVR-3	0	2600	38000	4400	31000	<1000	740J	<1000	15	<20000	<2000	<20000	<20000	<20000	<2000	<200000	<20000
AFVR-4	0	13000	20000	810J	29000	<2500	770J	1900J	230	81000	<500	<5000	3200J	<5000	2100J	<50000	<5000
AFVR-5	0	7900	20000	1500	22000	<500	740	590	430	4700J	<1000	<10000	520J	<10000	960J	<100000	<10000
AFVR-6	0	16000	39000	4000	27000	440	900	1500	610	21000	<500	<5000	1300J	<5000	2900	<50000	<5000

* CoC concentrations may vary due to seasonal fluctuations in the groundwater.

* CoC SSTL concentrations to be set at levels detected after the removal of free phase product.

NS: not sampled

NA: not analyzed

Bold: CoC concentrations greater than SSTLs

SSTL Tables

Site-specific target levels (SSTLs) for interim payment under this solicitation.

Free Product SSTLs

Monitoring Well	Free Product Thickness (feet)
MW-13	0.07
Total Initial Thickness	0.8
Total SSTL Thickness	0.07
Total Initial Thickness Above SSTL	0.73

Dissolved SSTLs

Well	Benzene	Toluene	Ethylbenzene	Xylene	Napthalene	MIBE	EDB	1,2 DCA	TAA	TBA	DIPE
MW-1	3000	<u>26540</u>	3600	<u>21680</u>	940	1000	26	1000			
MW-7	5	5	5	5	5	5	0.019	5			
MW-8	5	5	5	5	5	5	0.02	5			
MW-11	5	5	39	260	30	5	0.019	5			
MW-12	380	8500	1700	20000	650	500	0.48	500			
MW-13	<u>44390</u>	<u>26540</u>	<u>3700</u>	<u>21680</u>	<u>6700</u>	<u>173000</u>	<u>1900</u>				
MW-14	20000	56000	4400	28000	650	2500	190	109	62000	3300	1500
MW-16	50	50	520	3300	430	50	0.019	50			
MW-17	16000	37000	3600	22000	550	420	55	589	46000	6600	2000
MW-18	4600	36000	4900	27000	630	56	16	1000	390		
MW-21	5	5	5	8.5	5	5	0.029	5	100	100	10
AFVR-1	5	5	80	380	29	5	0.019	5			
AFVR-2	780	11000	2100	18000	790	250	1.5	250			
AFVR-3	2600	38000	4400	31000	740	1000	15	1000			
AFVR-4	13000	20000	810	29000	770	2500	230	187	81000	3200	2100
AFVR-5	7900	20000	1500	22000	740	500	430	590	4700		960
AFVR-6	16000	39000	4000	27000	900	440	610	1500	21000		2900
Totals:	128725	318655	35364	285882.5	14564	182241	3474	6800	215190	13200	9470


Italic: Laboratory analysis is less than calculated SSTL. SSTL is set equal to laboratory analysis.

Bold: Laboratory analysis is below detection limit. SSTL is set equal to detection limit

Underline: Calculated SSTL is greater than solubility limits. SSTL is set to solubility limits.

Appendix C

UIC Permit Application

Form I UIC	 Underground Injection Control Permit Application Ground-Water Protection Division <small>(Collected under the Authority of Title 48 Chapter 1 of the 1976 South Carolina Code of Laws)</small>		I. EPA ID NUMBER			
			T/A		C	
	U					
Read attached instructions before starting. For Official Use Only						
Application Approved month day year		Date Received month day year		Permit Well Number		
Comments						
II. Facility Name and Address				III. Owner/Operator and Address		
Facility Name Copeland's Service				Owner/Operator Name Harold Copeland		
Street Address 700 Musgrove Street				Street Address 2961 Hurricane Church Road		
City		State		Zip Code		
Clinton		South Carolina		29325		
IV. Ownership Status (Select One)				V. SIC Codes		
<input type="checkbox"/> A. Federal		<input type="checkbox"/> B. State		<input checked="" type="checkbox"/> C. Private		
<input type="checkbox"/> D. Public		<input type="checkbox"/> E. Other (Explain)				
VI. Well Status (Select A, B or C)						
<input type="checkbox"/> A. Operating		Date Started (MM/DD/YYYY)		<input type="checkbox"/> B. Modification/Conversion		<input checked="" type="checkbox"/> C. Proposed
VII. Type of Permit Requested - Class and Type of Well (see reverse)						
A. Class(es) enter code(s) Class V.A		B. Type(s) enter code(s) Corrective Action (I)		C. If class is "other" or type is code 'Y', explain		D. Number of Wells per type 175 Wells
VIII. Location of Wells or Approximate Center of field or Project						
C		A. Latitude			B. Longitude	
I		Deg 34	Min 28	Sec 56	Deg 81	Min 52 Sec 28
IX. Attachments						
Complete the following questions on a separate sheet(s) and number accordingly; see instructions for Classes 11, 111, and V, complete and submit on a separate sheet(s) attachments A-U as appropriate. Attach maps where required. List attachments by letter which are applicable and include with your application.						
X. Certification						
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment.						
A. Name (Type or Print)			Title		B. Phone No.	
C. Signature					D. Date Signed (MM/DD/YYYY)	

Activity for Review

Corrective Action Wells

The site is located at 700 Musgrove Road, in Clinton, South Carolina, as shown on **Figure 1**. A site map showing the site features, monitoring wells and the area of concern is included as **Figure 2**. As part of an underground storage tank (UST) corrective action at the site, temporary injection wells are proposed to be installed to address the petroleum hydrocarbon plume at the site and properties in the vicinity.

This permit application describes the planned injection of magnesium sulfate and activated carbon within the surficial aquifer at the site. Sodium sulfate may be substituted for magnesium sulfate based on material availability and current pricing. In areas where free product has accumulated a surfactant such as sodium laurel sulfate, an ingredient used in many common soaps, may be used in combination with AFVR extraction, to improve free product recovery. The injections are planned, using temporary injection points constructed of 1.5-inch to 2.25-inch diameter drilling rods, with expendable Geoprobe compatible well points. The well points will be installed utilizing direct push drilling techniques.

The majority of the temporary injection points will be up to 50 feet in depth and will be installed in petroleum impacted areas within the monitoring well network shown on **Figure 2** attached. The total number of temporary injection points will be up to 170 injection points. Up to 35 of the temporary injection points may be converted into permanent injection points using 1 to 2-inch diameter PVC well screen and riser.

The temporary well points will be abandoned after the injection activities are completed at each injection point. After injection, at each of the temporary wells, a licensed well driller will properly abandon each of the injection wells.

Well Construction Details

Injection Wells – Temporary injection points will be constructed using 1.5 inch to 2.25-inch diameter drilling rods, with expendable Geoprobe compatible well points, using direct push drilling techniques. Up to 30 feet of PVC screen may be used in the construction of the permanent injection wells. Schematics of the construction details for the temporary and permanent injection wells are attached.

Recovery Wells - If needed, up to five 1 to four-inch recovery wells will be installed for free product removal by vacuum extraction and/or skimmer pumps. The recovery wells will be constructed of 1 to 4-inch diameter PVC risers and 10 to 20 feet of 0.01 inch PVC well screen. A schematic of the construction details is attached.

Operating Data – Injection Wells

Injection Rates – Due to heterogeneities in the surficial aquifer at the site, the injection rates will vary from 0.5 gallons per minute to 25 gallons a minute. Based on data from previous consulting reports, the average hydraulic conductivity of the surficial aquifer is on the order of 0.68 feet per day. The surficial aquifer is comprised of silty to clayey sands.

Injection Pressure – Depending on the permeability in each injection area of the site, the injection pressures at the site will vary from gravity fed to 180 pounds per square inch.

Injection Schedule – Depending on the rate of injectant infiltration within the formation, the injection event at any given well point will be over a 2 to 6-hour period with some cycling to allow the injectant to infiltrate into the aquifer.

Contaminant Constituents – The contaminant release at the site is from a petroleum hydrocarbon release that is comprised of benzene, toluene, ethylbenzene xylene, (BTEX), methyl-tert-butyl ether (MTBE), oxygenates, naphthalene, and ethylene dibromide (EDB).

Project Schedule: The project is planned to be completed over a 30 to 60-month period depending on the effectiveness of the planned remediation activities.

Monitoring Program

As per the corrective action plan for the site, the monitoring well network will be sampled semi-annually. The wells listed below will be sampled for sulfate during the semi-annual monitoring well sampling events.

MW-11
MW-12
MW-14
MW-18

Attachment E

Existing or Pending State / Federal Permits

The corrective action is being performed under the State of South Carolina State Underground Petroleum Environmental Response Bank (SUPERB) program. The site had USTs installed on site that had reportedly caused petroleum to release to the groundwater beneath the site. The petroleum hydrocarbon release at the site was reported under SCDHEC Permit No. 05694.

Description of Business

The site is located at 700 Musgrove Street in Clinton, South Carolina. The property is formerly operated as Copeland's Service station, which is currently not in operation. The current site features are shown on **Figure 2**.

**Area of Review
(See Attached Figures)**

The area of review is limited to the area shown on **Figure 2**. The petroleum hydrocarbon plume and the installations of the temporary injection wells are limited to the area shown on **Figure 2**. A topographic map showing a $\frac{1}{4}$ radius from the proposed injection well area is provided in the attached figures. According to previous consulting reports, there are no water supply wells located in the vicinity of the site.

Maps of Wells and Area of Review

(See Attached Figures)

A topographic map showing a one-mile radius from the area of injection is included in the attached figures. A groundwater elevation map of the surficial aquifer is included in the attached figures. The area of review is limited to the area within the monitoring well network shown on **Figure 2**.

Cross Sections

(See Attached Figures)

Drinking Water Sources

Review of previous consulting reports indicates that no water supply wells have been reported to be located within the vicinity of the site.

Hydraulic Control

Aquifer Properties

Based on data from previous consulting reports the following estimates were calculated.

Seepage Velocity:

For the surficial aquifer:

Hydraulic Gradient: $i = 0.013 \text{ ft./ft.}$

Porosity = $n = 0.30$

Average Hydraulic Conductivity = $K = 0.68$

Seepage Velocity $V_s = Ki / n$

The seepage velocity is estimated as follow:

$V_s = 0.03 \text{ feet per day}$

Transmissivity:

$T = bK$

Where:

T = transmissivity in square feet per day.

b = saturated thickness in feet

K = hydraulic conductivity in feet per day.

For the surficial aquifer, the transmissivity is estimated as follows:

$b = 50 \text{ ft.}$

$K = 0.03 \text{ ft./day}$

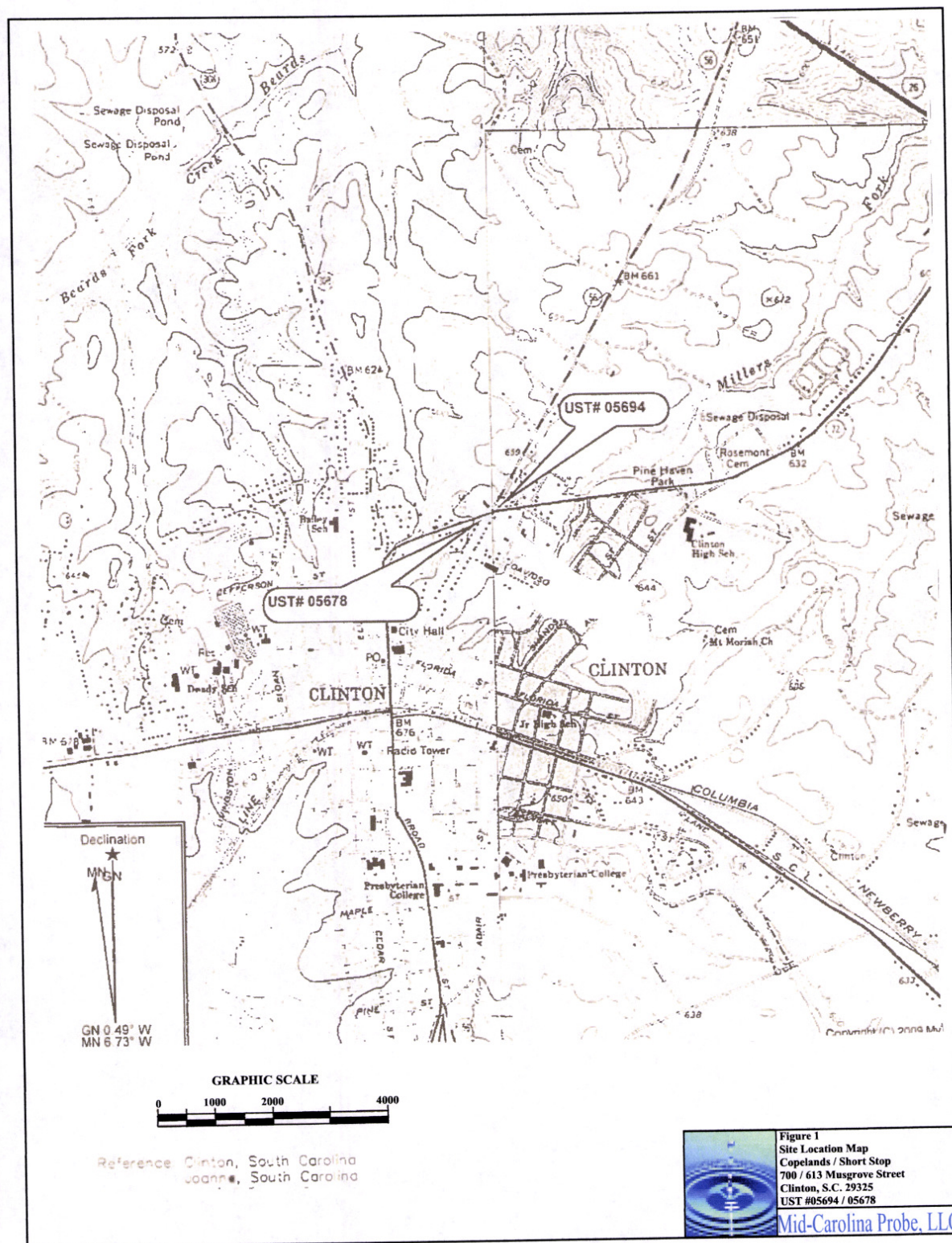
$T = 1.5 \text{ square ft. / day}$

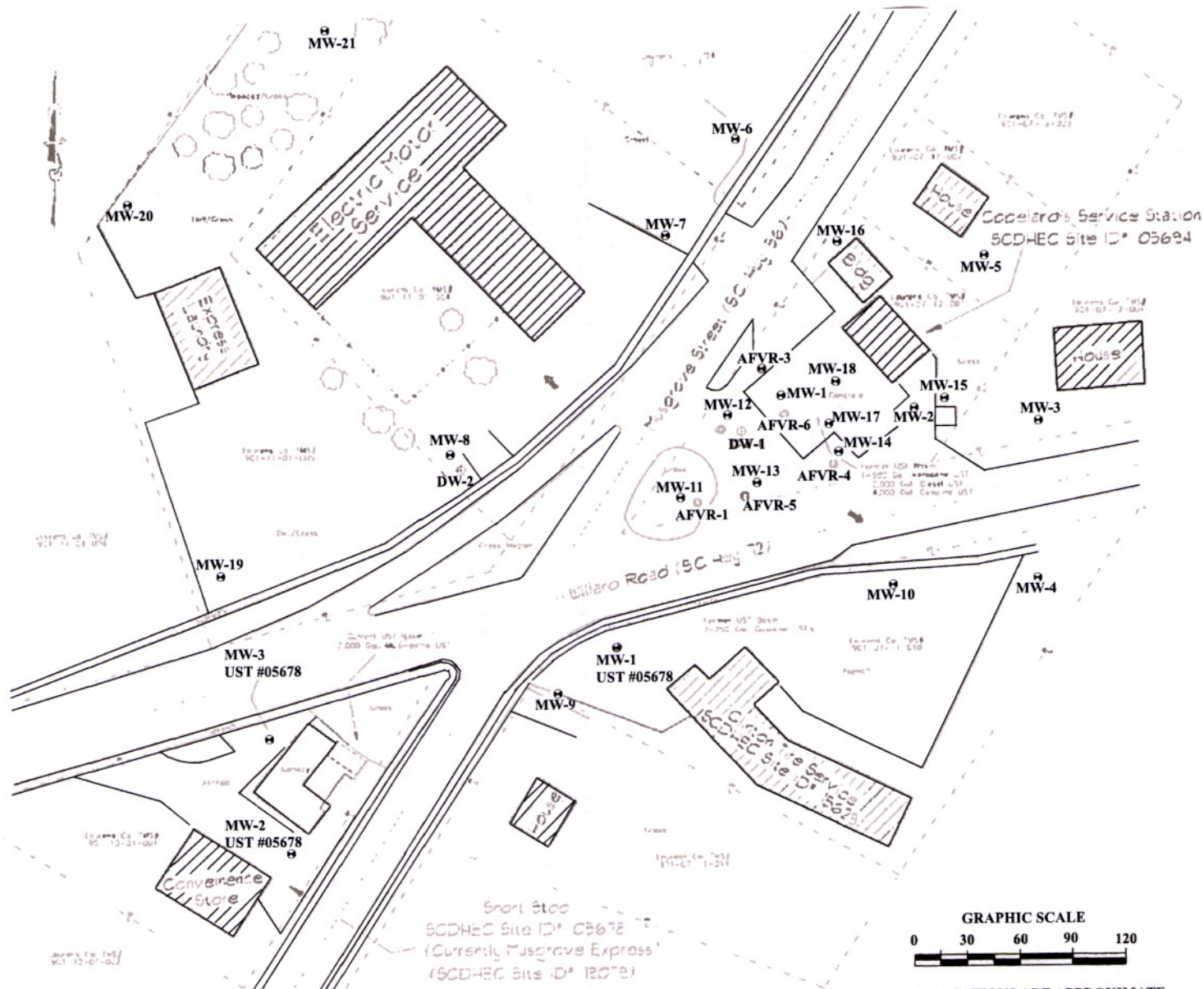
Injection Substrate – Magnesium sulfate and/or sodium sulfate along with activated carbon will be injected incrementally within the surficial aquifer in order to achieve a safe target concentration of sulfate within the aquifer. The application of sulfate will be made in iterative steps to ensure that over application of sulfate does not occur. The sulfate volume applied is typically much less than 1% of the treated aquifer volume; therefore, safe levels of sulfate concentration can be implemented and maintained throughout the treatment area.

Monitoring of sulfate will be performed in select monitoring wells on the site. The sulfate drinking water maximum contaminant level is 250 mg/l. Spikes in sulfate concentrations may occur around the injection points within the surficial aquifer at concentrations typically in the 500 mg/l to 15,000 mg/l range, which will decrease to target levels as the resulting biostimulation occurs and as the initial sulfate concentrations are diluted by the aquifer. The ratio of carbon to sulfate by weight will vary from 0 to 100% carbon / 0 to 100% sulfate. The carbon and sulfate will be injected with up to 80 % potable water by weight.

Injectant Containment - The sulfate will be decreased by dilution within the aquifer and depleted as the microbial degradation of the hydrocarbon plume increases. The utilization of the sulfate by the resulting microbial population increase and dilution within the aquifer will deplete the levels of sulfate within the aquifer. Sulfate groundwater monitoring results will be reviewed and evaluated to determine if additional sulfate injections are necessary.

Figures and Attachments
(UIC Permit)





Drawing Based on PCH - field Notes Tax Maps and a RLS Survey thru to day July 10, 2004

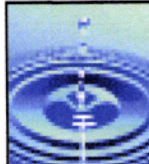
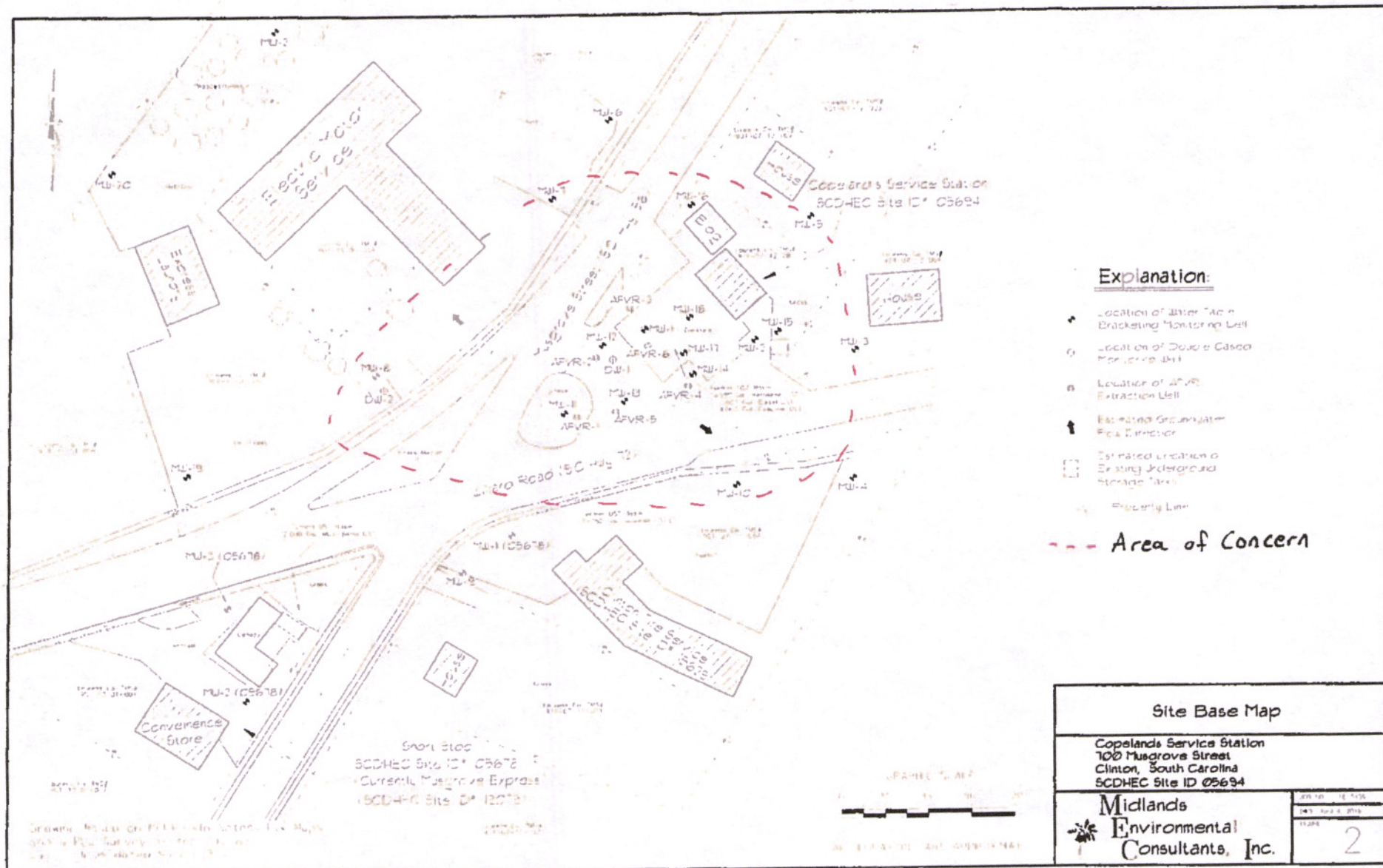


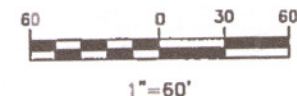
Figure 2
 Copelands Service Station
 700 Musgrove Street
 Clinton, S.C. 29325
 UST #05694

Mid-Carolina Probe, LLC



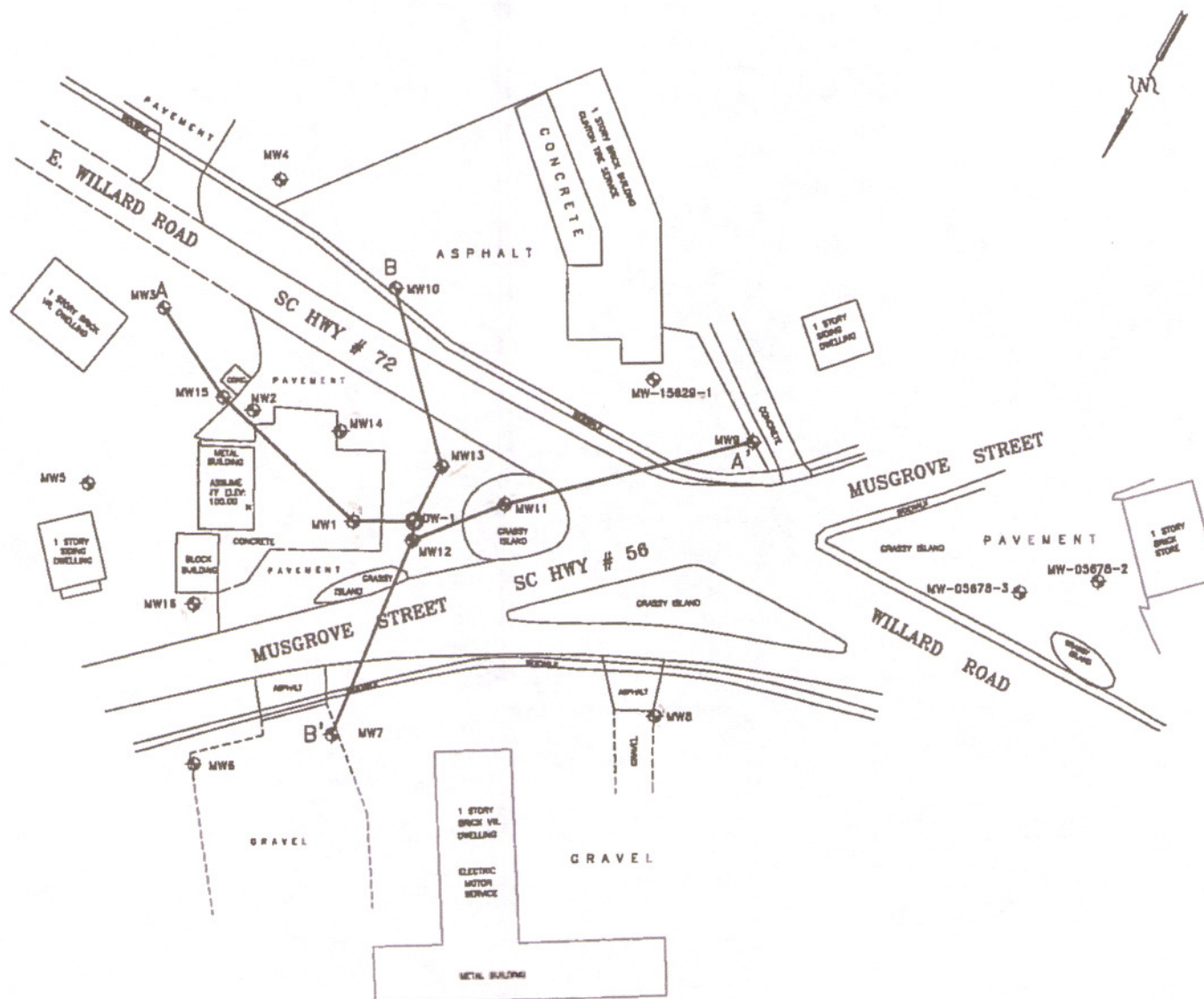
LEGEND

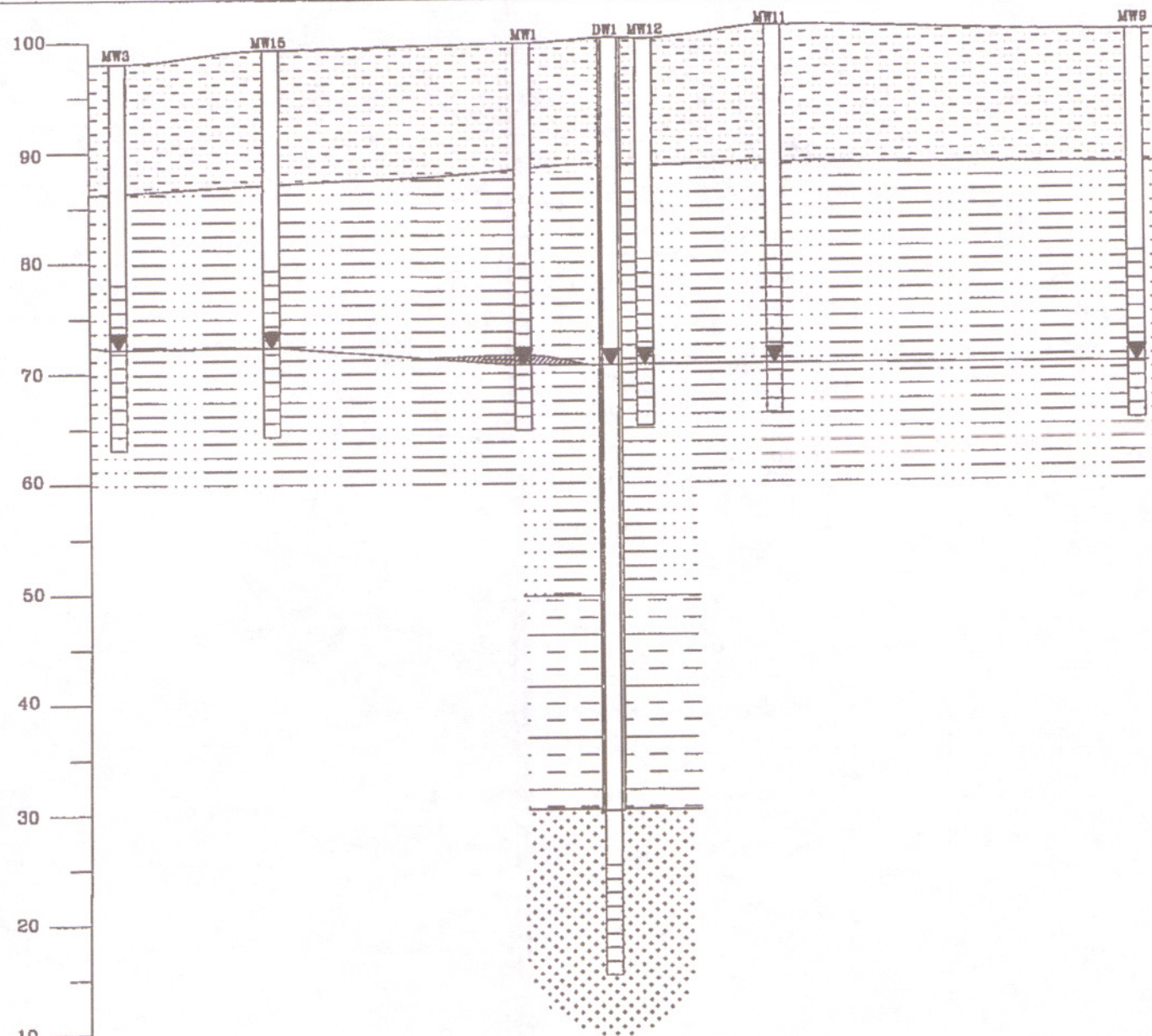
- ⊕ TYPE II MONITORING WELL
- ⊙ TYPE III MONITORING WELL




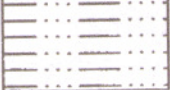
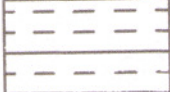


CROSS SECTION TRACES
COPELANDS BP/SERVICE STATION
SCDHEC SITE #05694/05698
CLINTON, LAURENS COUNTY
SOUTH CAROLINA

FIGURE: 3	PROJECT: A88170/ A88171
SCALE: 1" = 60'	FILE: COPELANDS
DATE: 08-03-99	DRAWN BY: TEC





LEGEND

-  BROWN-ORANGE TO TAN SANDY CLAY TO CLAYEY SAND
-  ORANGE TO BROWN-TAN SLIGHTLY CLAYEY SILTY SAND TO SANDY SILTY CLAY
-  OLIVE SILTY CLAY
-  GRANITIC BEDROCK
-  FREE PRODUCT

NOTE: DIAMETER OF WELLS ARE NOT TO SCALE

▼ WATER ELEVATION (01-20-99)

~ WATER TABLE (01-20-99)



1" = 40'

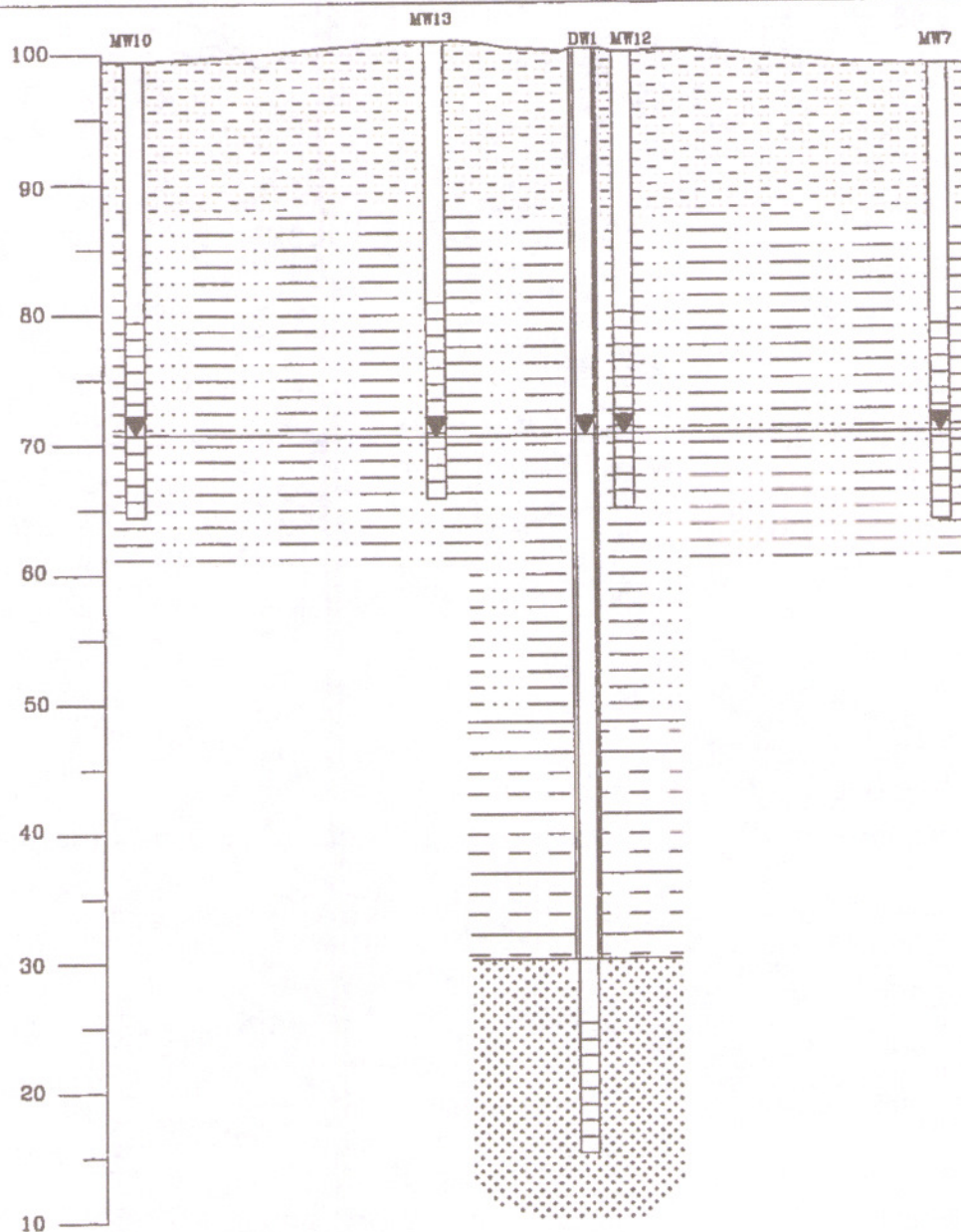
VERTICAL EXAGGERATION 4X



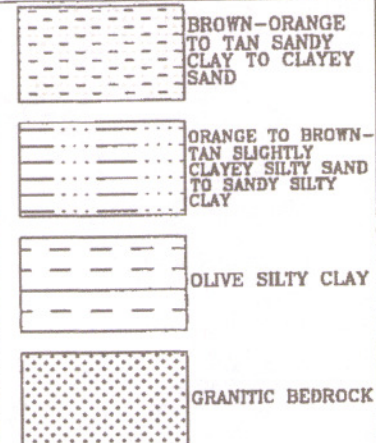
CROSS SECTION A-A'

COPELANDS BP/SERVICE STATION
SCDHEC SITE #05694/05698
CLINTON, LAURENS COUNTY
SOUTH CAROLINA

FIGURE: 4	PROJECT: A89170/ A89171
SCALE: 1" = 40'	FILE: CSECTION
DATE: 08-01-99	DRAWN BY: JMCH



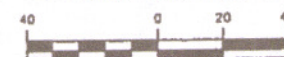
LEGEND



NOTE: DIAMETER OF WELLS ARE NOT TO SCALE

WATER ELEVATION (01-20-99)

WATER TABLE (01-20-99)



1"=40'

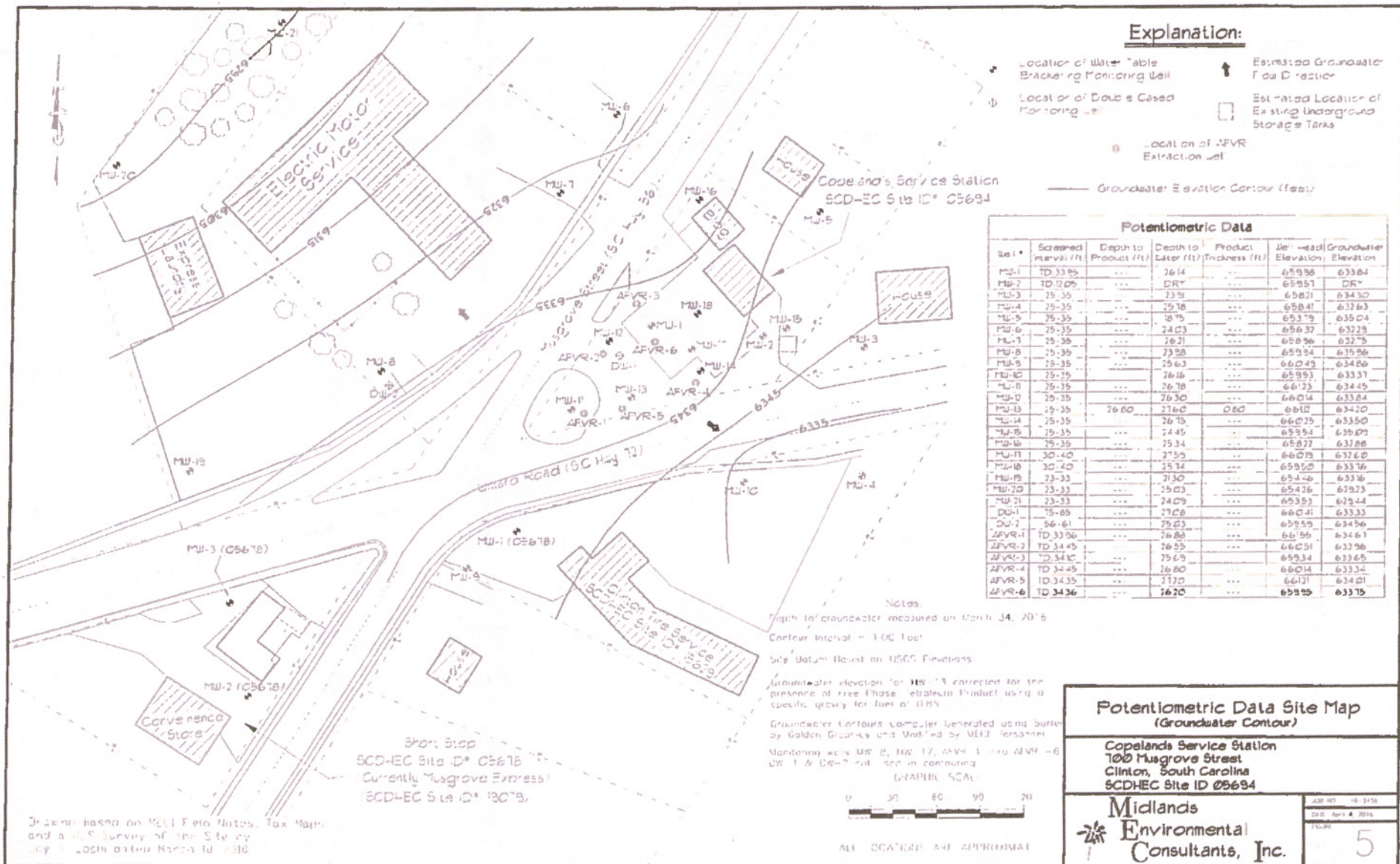
VERTICAL EXAGGERATION 4X

MARSHALL MILLER
 & ASSOCIATES

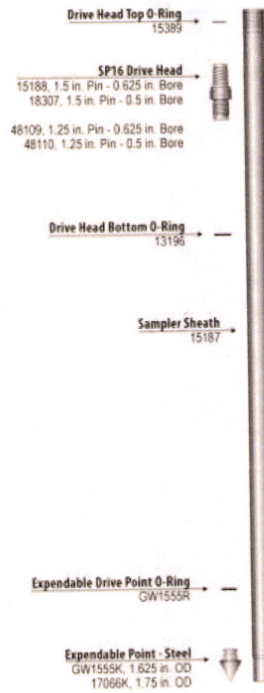
CROSS SECTION B-B'

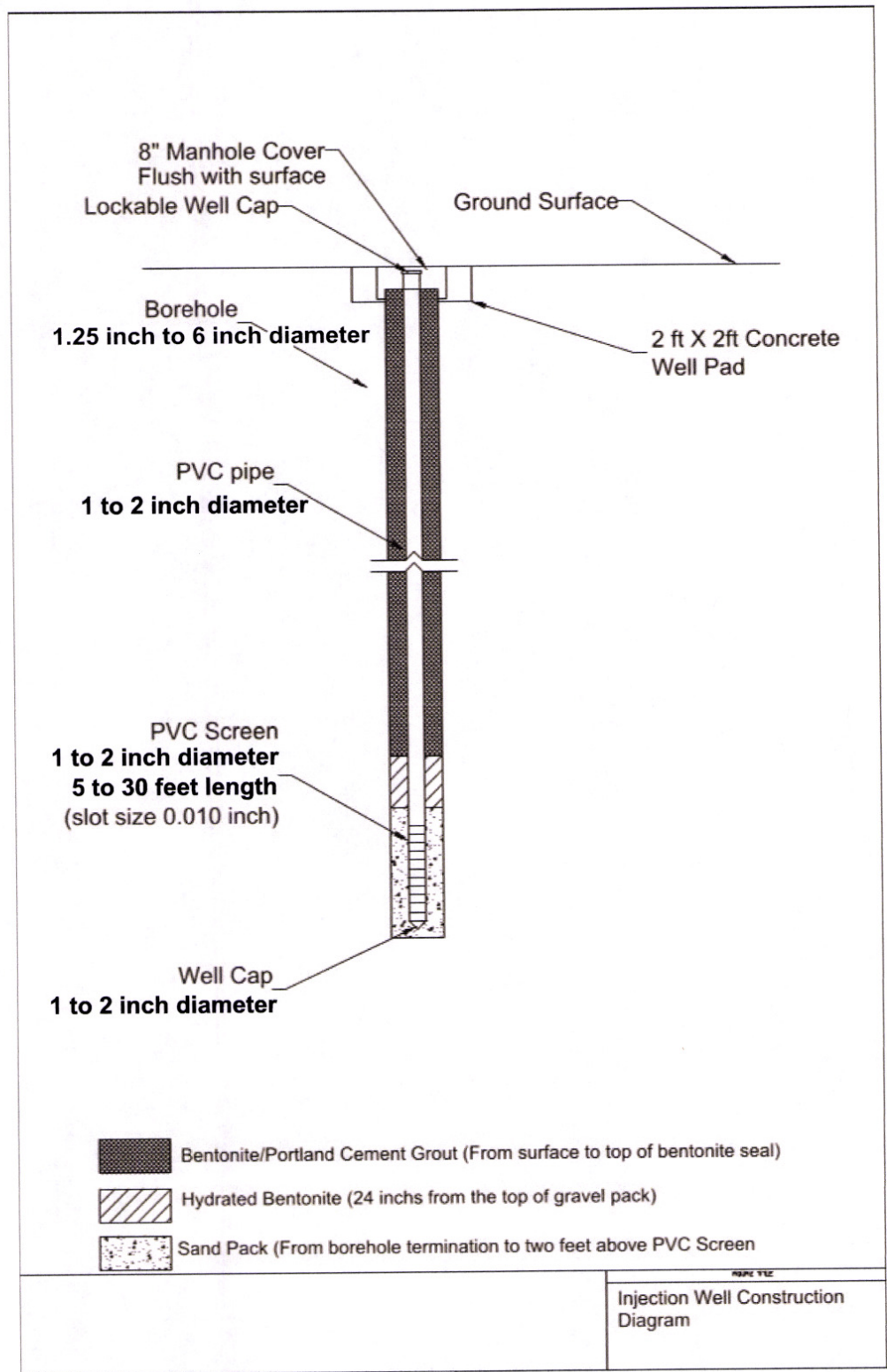
COPELANDS BP/SERVICE STATION
 SCDHEC SITE #05694/05698
 CLINTON, LAURENS COUNTY
 SOUTH CAROLINA

FIGURE: 5	PROJECT: A89170/ A89171
SCALE: 1" = 40'	FILE: CSECTION
DATE: 08-01-99	DRAWN BY: JMCH



Temporary Injection Well Diagram





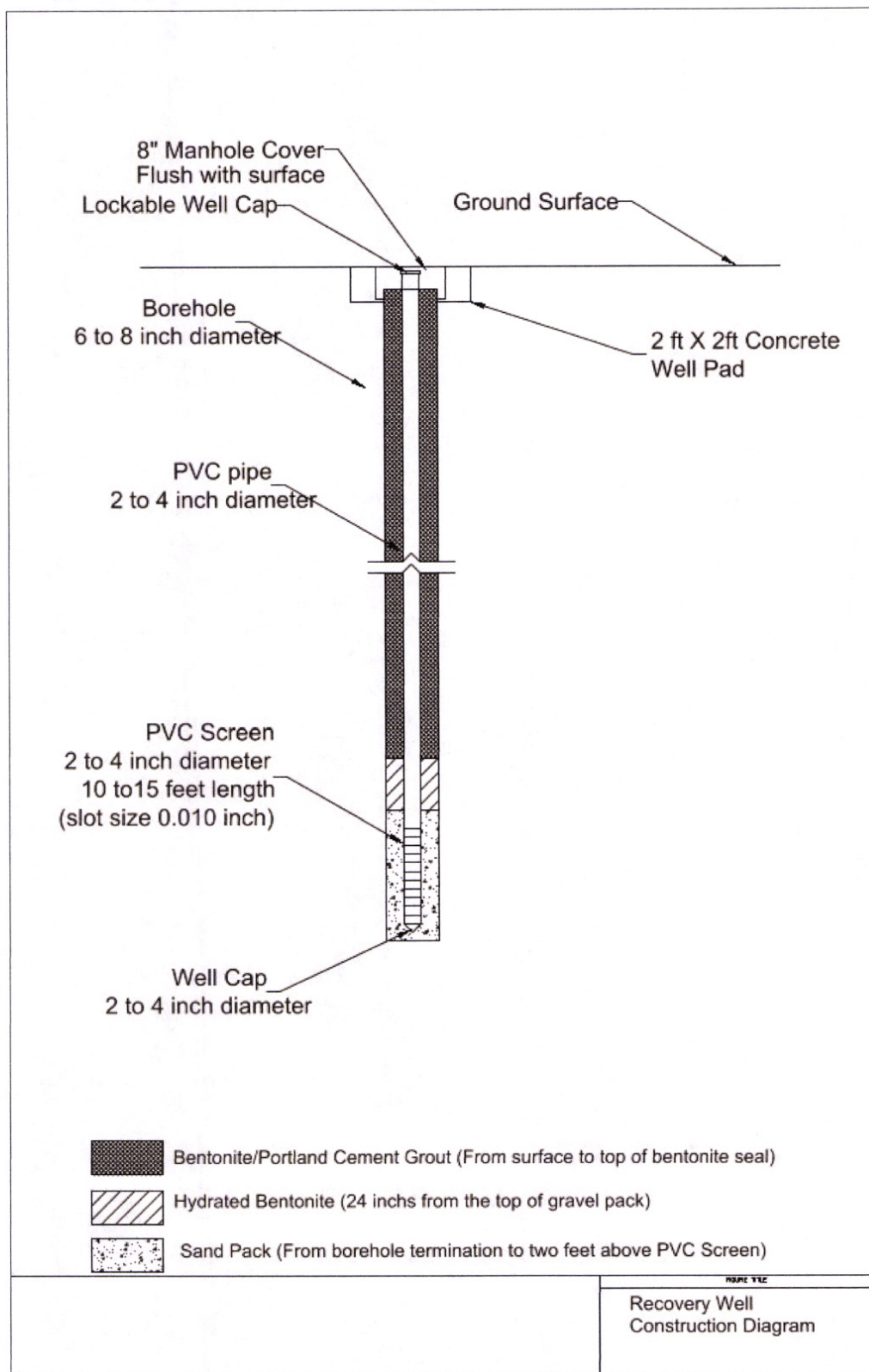


Table of Current CoC Concentrations and FPP Thicknesses in Groundwater

CoC concentrations in parts per billion (µg/l) and free-phase product thicknesses in feet based on the March 24, 2016 sampling and gauging:

Well	FPP Thickness (ft)	Benzene	Toluene	Ethylbenzene	Xylenes	MtBE	Naphthalene	1,2 DCA	EDB	TAA	TAME	ETBA	TBA	TBF	DIPE	ETHANOL	ETBE
MW-1	0	3000	31000	3600	29000	<1000	940J	<1000	26	<20000	<2000	<20000	<20000	<20000	120J	<200000	<20000
MW-3	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-4	0	<5	<5	<5	<5	4J	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-5	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-6	0	<5	<5	<5	0.78J	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-7	0	<5	<5	<5	1.8J	<5	0.39J	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-8	0	<5	<5	<5	<5	<5	<5	<5	<0.02	<100	<10	<100	<100	<100	<10	<1000	<100
MW-9	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-10	0	<5	<5	<5	<5	5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-11	0	<5	0.87J	39	260	<5	30	<5	<0.019	<100	<10	<100	6.5J	<100	<10	<1000	<100
MW-12	0	380J	8500	1700	20000	<500	650	<500	0.48	<10000	<1000	<10000	<10000	<10000	<1000	<100000	<10000
MW-13	0.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
MW-14	0	20000	56000	4400	28000	<2500	650J	1400J	190	62000	<5000	<50000	3300J	<50000	1500J	<500000	<50000
MW-15	0	<5	<5	<5	<5	<5	<5	<5	0.018J	<100	<10	<100	<100	<100	<10	<1000	<100
MW-16	0	<50	50	520	3300	<50	430	<50	<0.019	<1000	<100	<1000	160J	<1000	<100	<10000	<1000
MW-17	0	16000	37000	3600	22000	420J	550J	1200	55	46000	<2000	<20000	6600J	<20000	2000	<200000	<20000
MW-18	0	4600	36000	4900	27000	56J	630J	<1000	16	390J	<2000	<20000	<20000	<20000	<2000	<200000	<20000
MW-19	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-20	0	<5	<5	<5	<5	<5	<5	<5	<0.019	<100	<10	<100	<100	<100	<10	<1000	<100
MW-21	0	2.2J	<5	<5	8.5	<5	0.92J	<5	0.029	10J	<10	<100	4.7J	<100	<10	<1000	<100
DW-1	0	3900	<250	<250	<250	<250	92J	<250	<0.019	7800	<500	<5000	640J	<5000	260J	<50000	<5000
DW-2	0	1100	<50	3.5J	1200	<50	150	120	0.078	3700	<100	<1000	260J	<1000	150	<10000	<1000
AFVR-1	0	<5	1.5J	80	380	<5	29	<5	<0.019	<100	<10	<100	7.9J	<100	<10	<1000	<100
AFVR-2	0	780	11000	2100	18000	<250	790	<250	1.5	160J	<500	<5000	<5000	<5000	38J	<50000	<5000
AFVR-3	0	2600	38000	4400	31000	<1000	740J	<1000	15	<20000	<2000	<20000	<20000	<20000	<2000	<200000	<20000
AFVR-4	0	13000	20000	810J	29000	<2500	770J	1900J	230	81000	<500	<5000	3200J	<5000	2100J	<50000	<5000
AFVR-5	0	7900	20000	1500	22000	<500	740	590	430	4700J	<1000	<10000	520J	<10000	960J	<100000	<10000
AFVR-6	0	16000	39000	4000	27000	440	900	1500	610	21000	<500	<5000	1300J	<5000	2900	<50000	<5000

* CoC concentrations may vary due to seasonal fluctuations in the groundwater.

* CoC SSTL concentrations to be set a levels detected after the removal of free phase product.

NS: not sampled

NA: not analyzed

Bold: CoC concentrations greater than SSTLs

SSTL Tables

Site-specific target levels (SSTLs) for interim payment under this solicitation.

Free Product SSTLs

Monitoring Well	Free Product Thickness (feet)
MW-13	0.07
Total Initial Thickness	0.8
Total SSTL Thickness	0.07
Total Initial Thickness Above SSTL	0.73

Dissolved SSTLs

Well	Benzene	Toluene	Ethylbenzene	Xylene	Napthalene	MtBE	EDB	1,2 DCA	TAA	TBA	DIPE
MW-1	3000	26540	3600	21680	940	1000	26	1000			
MW-7	5	5	5	5	5	5	0.019	5			
MW-8	5	5	5	5	5	5	0.02	5			
MW-11	5	5	39	260	30	5	0.019	5			
MW-12	380	8500	1700	20000	650	500	0.48	500			
MW-13	44390	26540	3700	21680	6700	173000	1900				
MW-14	20000	56000	4400	28000	650	2500	190	109	62000	3300	1500
MW-16	50	50	520	3300	430	50	0.019	50			
MW-17	16000	37000	3600	22000	550	420	55	589	46000	6600	2000
MW-18	4600	36000	4900	27000	630	56	16	1000	390		
MW-21	5	5	5	8.5	5	5	0.029	5	100	100	10
AFVR-1	5	5	80	380	29	5	0.019	5			
AFVR-2	780	11000	2100	18000	790	250	1.5	250			
AFVR-3	2600	38000	4400	31000	740	1000	15	1000			
AFVR-4	13000	20000	810	29000	770	2500	230	187	81000	3200	2100
AFVR-5	7900	20000	1500	22000	740	500	430	590	4700		960
AFVR-6	16000	39000	4000	27000	900	440	610	1500	21000		2900
Totals:	128725	318655	35364	285882.5	14564	182241	3474	6800	215190	13200	9470

Italic: Laboratory analysis is less than calculated SSTL. SSTL is set equal to laboratory analysis.

Bold: Laboratory analysis is below detection limit. SSTL is set equal to detection limit

Underline: Calculated SSTL is greater than solubility limits. SSTL is set to solubility limits.